Cutting Tool

The invention relates to a cutting tool of a cutting machine having a base element and a chisel holder, wherein the chisel holder is provided with a plug-in shoulder which is retained in a plug-in receptacle of the base element, and wherein the plug-in receptacle is spatially connected with its surroundings via one or several openings.

Such a cutting tool is known from DE 43 22 401 C2. The cutting tool contains a chisel holder and a base element which is fastened to a cylinder-shaped cutting body of a cutting machine. For fastening the chisel holder on the base element, the latter has a plug-in receptacle with a Vee- guide, into which a plug-in shoulder of the chisel holder can be pushed. The chisel holder is fixed in place with the aid of a pressure screw. In this connection the exact positioning of the chisel holder is given particular importance, also in case of repeated assembly/disassembly and exchange.

For absorbing the forces occurring in the course of the operation, the base element has a stop, on which the chisel holder is supported. So that the effects of the stop are maintained and stress on the plug-in shoulder and the plug-in receptacle is prevented to the greatest extent possible, the chisel holder is arranged offset by an adjusting space in the area around the plug-in receptacle.

It has been shown to be disadvantageous in connection with such cutting tools which are employed, for example, in road construction, that pulverized rock and water penetrate the area of the plug-in shoulder and the plug-in receptacle. Pulverized rock and water can cause the plug-in shoulder, as well as the pressure screw, to become caught in the

plug-in receptacle. Because of this, the chisel holder can only be released from the base element with increased effort. Often the parts are damaged in the course of the forcible separation, which results in a more cost-intensive replacement. Moreover, the pulverized rock results in increased wear in this area, which leads to reduced service life and therefore to higher operating costs. In the course of releasing the pressure screw, dirt which becomes caught on the pressure screw from the interior, is worked into the threaded receptacle of the base element and damages it. A repair or replacement of the base element which must take place then can only be performed with added outlay, because customarily the base element is welded to the cutting cylinder tube and the adjacent base elements.

Dirt on the plug-in shoulder of the chisel holder and in the area of the plug-in receptacle of the base element is particularly disadvantageous. The particles adhering there are shattered in the course of the subsequent operation of the machine. Play is then created between the plug-in shoulder and the plug-in receptacle. The exactly fitted positioning of the chisel holder is then no longer assured. This has a negative effect, in particular in the course of so-called fine milling. This method, which is gaining importance in actual use, is used to mill road surfaces to their final quality in one processing step. A prerequisite for this is that the chisel holders are exactly positioned. If one chisel holder does not meet these criteria, it causes a wrong spot in the milling pattern, which has an effect on the total result. Thus, a chisel holder which is seated loosely in the base element can decisively worsen the milling quality. It can furthermore occur that the loosely seated chisel is completely separated from the base element and causes serious damage to the tool.

It is the object of the invention to produce a cutting tool of the type mentioned at the outset, wherein the service life of the tool, in particular of the base element, is improved.

This object is attained in that at least one of the openings is at least partially closed by means of a sealing element.

The sealing element protects the transition area of the plug-in receptacle formed between the plug-in shoulder and the base element. It prevents the penetration of the plug-in receptacle by removed material and water in a simple and effective way. Once the chisel holder has reached its worn state, it can be pulled out of the plug-in receptacle. The reception chamber formed by the plug-in receptacle remains clean and substantially free of dirt. It is possible to exactly position and fasten a fresh chisel holder with little loss of time. Thus, the sealing element constitutes a simple component, which permits a more effective tool change, and at the same time substantially increases the service life of the base element. The sealing element can also be constituted by a grease layer.

Depending on the shape and arrangement of the sealing element, a reproducible and exactly fitting position of the chisel holder is made possible.

In accordance with a preferred embodiment variation of the invention it can be provided that the sealing element is arranged around the plug-in receptacle, at least in some areas between the chisel holder and the base element. By means of this an area is protected through which often massive amounts of dirt can enter.

Particularly effective sealing is achieved in that the sealing element is embodied as a molded element having the contour of the circumference of the plug-in

shoulder of the chisel holder. The design is furthermore particularly installation-friendly, because the sealing element can be placed on the plug-in shoulder of the chisel holder for mounting and can then be installed in the base element together with the chisel holder.

Because the base element has a circumferential bezel around the plug-in receptacle, which is used as a seat for the sealing element, it is achieved that the sealing element is immovably seated during operations. Moreover, the bezel provides the space into which the sealing element is definitely pressed in the course of mounting without a possibility of being destroyed itself. An optimal sealing effect is achieved by this.

Permanent sealing of the area to be protected is achieved in that the sealing element is made of a permanently elastic material, preferable of silicon, or of a thermoplastic elastomer.

A preferred embodiment provides that the chisel holder rests with its stop against the stop of the base element, that the base element has a shoulder extending at an angle in relation to the stop, that a clearance acting as an adjusting space is formed between the shoulder of the base element and the side of the chisel holder facing the shoulder, wherein the sealing element is shaped in such a way that it bridges this clearance. By means of this it is achieved that pulverized rock and water cannot penetrate the plug-in receptacle through the adjustment space.

A particularly easy assembly and assured sealing effects are achieved in that the sealing element is angled in a manner corresponding to the angle between the shoulder and the stop of the base element.

Good sealing of the different gap widths in the area of the stop and the adjustment space can be achieved in that the sealing element has a section of an O-shaped cross section, which rests at least in part against the stop of the base element and has a section which is angled off in relation to the latter, which rests against the shoulder of the base element and has a thickened cross section which bridges the clearance at least partially.

An advantageous embodiment of the invention provides that the angled-off section has a wedge-shaped sealing lip, which is matched to the shape of the adjustment space. Unevenness and production tolerances of the chisel holder and the base element are compensated by this.

A cost-effective manufacture, even in large numbers, as well as narrow tolerance and a design matched to the production process, are made possible in that the sealing element is embodied as an injection-molded element, and the sprue nose is arranged in an area of the cross section which has been thickened corresponding to the clearance. By means of this it is achieved that the sprue nose does not hamper the sealing effect of the sealing element.

A simple and exactly fitting mounting of the chisel holder on the base element is achieved in that the sealing element is drawn as a separate plastic component on the plug-in shoulder, or that the sealing element is injection-molded on the plug-in shoulder as a plastic component.

A preferred embodiment of the invention provides that the chisel holder of the cutting tool is provided with a plug-in shoulder formed on a base body and the plug-in shoulder has a sealing element extending around the plug-in shoulder in at least partial areas

of its outer circumference. By means of this it is achieved that it is possible to preform the chisel holder with the plug-in shoulder and the sealing element as a structural unit, to stock it as a unit and to install it quickly and cost- effectively as a replacement part.

The invention will be explained in greater detail in what follows by means of exemplary embodiments represented in the drawings. Shown are in:

Fig. 1, in a lateral view and in section a cutting tool with an exchangeable chisel holder in the partially assembled state,

Fig. 2, in a lateral view and in section the cutting tool in accordance with Fig.1 with the chisel holder inserted,

Fig. 3a, a sealing element in a view from above,

Fig. 3b, the sealing element in accordance with Fig. 3a in a lateral view.

The cutting tool (1) in Fig. 1 consists of a base element (20), into which an exchangeable chisel holder (10) can be inserted. The cutting tool (1) furthermore has a sealing element (30) and a pressure screw (40), which is used for fixing the chisel holder (10) in place in the base element (20).

The chisel holder (10) consists of a base body (17) and on its lower end has a plug-in shoulder (15), which can be inserted into a corresponding plug-in receptacle (22) at the base element (20). The insertion movement of the chisel holder (10) into the base element (20) is limited in its rear area by a stop (11) at the chisel holder (10) and by a stop (24) on the base element (20) located opposite it. On its front edge, the plug-in shoulder (15) has at least one guide face (15.1), which is guided in the course of the insertion of the chisel holder (10) by means of a corresponding Vee- guide (22.1) in the plug-in receptacle (22).

Furthermore, the chisel holder (10) has a chisel receptacle (12), into which a turning chisel, which is also easy to exchange, can be inserted. The longitudinal axis of the chisel receptacle (12) forms an acute angle in respect to the axis of the plug-in shoulder (15).

A sealing element (30) has been drawn on the plug-in shoulder (15), whose contour is matched to the prism-shaped cross-section of the plug-in receptacle (15) with its guide faces (15.1). The sealing element (30) can be designed to be angled, corresponding to the angle between the shoulder (21) and the stop (24) of the base element (20). Here, the sealing (30) has an O-shaped cross section (31) in the area of the stop (24) and a cross section, which is thickened in comparison with it, in the area of the shoulder (21). In this case this area is preferably embodied as a wedge-shaped sealing lip (34).

In the area of the plug-in receptacle (22), the base element is provided with a bezel (23) extending around the plug-in receptacle (22), which is used as a seating for the sealing element (30).

Fig. 2 shows the same cutting tool as the one in Fig. 1 in section after the chisel holder (10) has been completely inserted into the base element (20). Here, the pressure screw (40), which has preferably been embodied as a stud screw and has a screw thread (41) and a flattened shaft (42), acts with its shaft (42) on a pressure face (14) constituted by a V-shaped recess (13) on the side of the plug-in shoulder (15) located opposite the guide face (15.1).

When the pressure screw (40) is tightened, forces result which push the chisel holder (10) against the base element (20), In the course of this the stop (11) of the chisel holder (10) is supported on the stop (24) of the base element. In the course of this, the

sealing element (30) is seated with its area (31) of O-shaped cross section in the bezel (23) of the base element (20) designed as the sealing seat. The originally O-shaped cross section is pressed during this in such a way that an optimum sealing effect is generated.

A clearance (16), acting as an adjustment space, is formed between the shoulder (21) in the front part of the base element (20) and the face of the chisel holder (10) located opposite the shoulder (21). Because of its cross section, which is thickened in this area, and the simultaneous embodiment as a wedge-shaped sealing lip (34), the sealing element (30) bridges the clearance (16), so that an optimal sealing effect is also achieved by this. By means of this it is achieved that no waste material particles can penetrate into the area of the plug-in receptacle. This makes the exchange of the chisel holders (10) easier. At the same time it is achieved by means of this arrangement that not water with waste material particles can penetrate the area of the shaft (42) and the pressure face (14) of the plug-in shoulder (15).

Figs. 3a and 3b represent an embodiment of the sealing element (30) in a view from above and in a lateral view.

The sealing element (30) is embodied as a molded part, having the contour of the circumference of the plug-in shoulder (15) of the chisel holder (10). The sealing element (30) is angled corresponding to the angle between the shoulder (21) and the stop (24) of the base element (20), wherein the sealing element (30) has at least one section of an O-shaped cross section, which rests against the stop (24) of the base element (20). The angled section (32) resting against the shoulder (21) of the base element (20) has a cross section which is

thickened corresponding to the clearance (16). An angled section (32) embodied as a wedge-shaped sealing lip (34) here increases the sealing effect.

In this case the sealing element (30) is made of a permanently elastic material and is preferably designed as an injection-molded element. Silicons are used as the materials. Examples of this are so-called liquid silicon rubbers (LSR), for example SILOPREN(R) made by GE BAYER Silicones, which can be produced by means of the so-called liquid injector molding (LIM) process. Furthermore suitable are thermoplastic elastomers, for example SANTOPRENE(R), made by ADVANCED ELASTOMER SYSTEMS, which can be worked by the normal injection-molding process. The sprue, which is customary in connection with injection-molding processes, has been displaced here into the thickened area of the clearance (16), so that the sprue nose (33) does not hamper the sealing effect of the sealing element (30).

It can furthermore be provided that the sealing element (30) is directly formed on the formed-on plug-in shoulder (15) of the chisel holder (10), and in this case encloses the exterior circumference of the plug-in shoulder (15) at least partially. In the same way it can be provided that the sealing element (30) is directly formed on the base element (20) in the area around the plug-in receptacle (22) and encloses the exterior circumference of the plug-in receptacle (22) at least partially.

It should be mentioned here that the invention is not limited to the cross-sectional shape of a plug-in shoulder (15) represented above. Instead, any arbitrary different cross-sectional variants are conceivable, such as round cross sections or plug-in shoulders of a conical shape, for example.

As it becomes clear from the drawings, the plug-in receptacle (22) in the base element (20) facing away from the chisel holder (10) is embodied to be open. This opening is closed, together with the connected cutting cylinder tube, not represented in the drawings, by means of a weld seam connection.